CLAIMS

1. A method of producing a linear di-substituted pyridinium compound, the method comprising the steps of:

(a) attaching a first 2, 3, or 4-substituted pyridine compound of the formula NC_5R_4-R'-X (1) to a solid support, to form a compound of the formula NC_5R_4-R'-Y-SUPPORT (2), wherein SUPPORT represents the solid support, R is selected from hydrogen, hydroxyl, and substituted or unsubstituted alkyl, alkoxy, aryl, alkaryl, aralkyl, and alkenyl groups, R' is a first linking group, X is a group which can react with the solid support to attach the first pyridine compound to the support, and Y is absent or is a second linking group;

(b) forming a di-substituted pyridine compound of the formula $^{-}A-^{+}NC_5R_4$-R'-Z (3) from a second 2, 3, or 4-substituted pyridine compound of formula (1), which second pyridine compound may be the same as or different to the first pyridine compound, wherein A is a protecting group, and Z is a leaving group;

(c) reacting the compound of formula (2) formed in step (a) with the compound of formula (3) formed in step (b), to form a di-substituted pyridinium compound of the formula $^{-}A-^{+}NC_5R_4$-R'-$[^{-}Q^{+}NC_5R_4$-R'-$]_n$Y-SUPPORT (4), wherein Q^{-} is a counter ion and n=1;

(d) optionally, repeating step (c) as many times as

required to obtain a compound of formula (4) wherein n is an integer of 2 or greater; and

(e) detaching the compound of formula (4) from the solid support, and reducing to form a di-substituted pyridinium compound of the formula $NC_5R_4-R'-[^-Q^+NC_5R_4-R'-]_n-X$ (5), wherein n is an integer, and Q^- and X are a counter ion and a group which can react with the solid support to attach the first pyridine compound to the support respectively, which may the same or different as Q and X defined above in steps (c) and (a) respectively.

2. A method according to claim 1 wherein each R group is hydrogen.

3. A method according to claim 1 or 2 wherein in step (d), step (c) is repeated such that in formula (5) n=20 to 100.

4. A method according to claim 1, 2 or 3 wherein the compound of formula (1) is prepared by reaction of a compound of formula Z'-R"-X with a pyridine compound, with protection of the X- group as necessary, wherein R" is a linker group and Z' is a suitable leaving group.

5. A method according to claim 4 wherein the compound of formula (1) is prepared by reacting Br-R"-OH with t-butyldimethyl-chlorosilane (TBDMSCl) to form Br-R"-OTBDMS,

which is reacted with 2,3 or 4-methylpyridine (2,3, or 4-picoline) with deprotection of the X group to form NC_5R_4-R'-OH.

6. A method according to any one of claims 1 to 5 wherein linker group R' has no terminal carbon atoms.

7. A method according to any preceding claim wherein each group R' is the same or different and is selected from an alkylene group, an alkenyl-containing group, and a cyclopropanyl-containing group.

8. A method according to claim 7 wherein each group R' is the same or different and is selected from a group $-(CH_2)_m-$, wherein m is an integer from 2 to 12, a group having from 2 to 12 carbon atoms containing one or more alkenyl groups, and cis- or trans- $-(CH_2)_p$-cyclopropanyl-$(CH_2)_q-$ wherein p and q are the same or different and are integers from 1 to 4.

9. A method according to any preceding claim wherein R' is a group which comprises a fluorescent group, or a group to which a fluorescent group can be attached.

10. A method according to claim 9 wherein R' has a pendant alcohol group, for attachment of a fluorescent group.

11. A method according to any preceding claim wherein in formula (1) X is selected from hydroxyl, carboxyl, thiol, and amine groups.

12. A method according to claim 11 wherein X is a hydroxyl group.

13. A method according to claim 12 wherein the compound of formula (1) is a compound of the formula $NC_5R_4-(CH_2)_n-OH$.

14. A method according to any preceding claim wherein the solid support material comprises an organic resin having functionality which can react with group X of the compound of formula (1).

15. A method according to claim 14 wherein the solid support material comprises trityl chloride or a functionalised polystyrene resin.

16. A method according to any preceding claim wherein group Y in formula (2) is an oxygen atom.

17. A method according to any preceding claim wherein in step (b) group X is converted to a mesyl (methanesulphonyl) group by reaction with mesyl chloride.

18. A method according to any preceding claim wherein A is oxygen or BH_3-.

19. A method according to claim 18 wherein A is oxygen, and the nitrogen atom of the second pyridine compound of formula (1) used in step (b) is converted to the N-oxide by reaction of the nitrogen atom of the pyridine group with a peracid.

20. A method according to claim 19 wherein the peracid comprises m-chloroperbenzoic acid.

21. A method according to any preceding claim wherein counter ion Q^- in step (c) is an iodide ion.

22. A method according to any preceding claim wherein oligomers having the formula (5) are released from the solid support and reintroduced as reagents as an alternative to, or in addition to, the second pyridine compound used in step (b).

23. A method according to claim 22 wherein a compound of formula $NC_5R_4-R'-[^-Q^+NC_5R_4-R'-]_n-X$ (5) is converted to a compound of formula $^-A-^+NC_5R_4-R'-[^-Q^+NC_5R_4-R'-]_n-Z$ (5a) per step (b), and the compound of formula (5a) is then reacted with the compound of formula (2) formed in step (a) or (c), per step (d).

24. A method according to any preceding claim wherein the compound of formula (4) is detached from the solid support, and reduced to form a di-substituted pyridinium compound of the formula $NC_5R_4-R'-[^-Q^+NC_5R_4-R'-]_n-X$ (5) using an acid.

25. A method according to claim 24 wherein the acid is hydrochloric acid, and counter ion Q^- is chloride.

26. A method according to any preceding claim wherein the di-substituted di-substituted pyridinium compound is a linked dialkyl pyridinium compound.

27. A method of producing a linear di-substituted pyridinium compound substantially as hereinbefore described with reference to Reaction Schedule 1.